FACULTEIT ECONOMIE
EN BEDRIJFSKUNDE

HOVENIERSBERG 24
B-9000 GENT
Tel. : 32 - (0)9 – 264.34.61
Fax. : 32 - (0)9 – 264.35.92

WORKING PAPER

What determines measured overeducation?

Dieter Verhaest [1]

Eddy Omey [2]

January 2004

2004/216

[1] SHERPPA (FEB, Ghent University)

[2] SHERPPA (FEB, Ghent University)

Address for correspondence: Dieter Verhaest, SHERPPA, Faculty of Economics and Business Administration, Ghent University, Hoveniersberg 24, 9000 Gent; e-mail: Dieter.Verhaest@UGent.be

We thank Bart Cockx, Gerdie Everaert, Freddy Heylen and Dirk Van de gaer for their helpful comments on an earlier draft of this paper. Financial support from the Fund for Scientific Research – Flanders (FWO Vlaanderen), the Flemish Ministries of Science and Technology and Education (PBO 1997 and 1998) and the Federal Public Planning Service Science Policy (Interuniversity Attraction Poles Program - Belgian Science Policy [Contract No. P5/21]) is gratefully acknowledged.

D/2004/7012/02

What determines measured overeducation?

Dieter Verhaest

SHERPPA (FEB, Ghent University)

SONAR

Eddy Omey

SHERPPA (FEB, Ghent University)

SONAR

Abstract

We analyse the determinants of overeducation among school leavers within a search theoretical framework. Overeducation is measured on the basis of job analysis (JA), the required level to get the job (RL) and realised matches (RM). It is shown that the choice of the measure is crucial for the outcome of the analysis. Job levels measured by RL and RM are clearly biased. Hence, only a few results are robust: higher qualified individuals occupy higher complexity jobs and overeducation is less prevalent among school leavers with better study results and in small organizations. Conversely, JA generally delivers results that are consistent with theoretical considerations. Based on JA, overeducation is also lower among men, whites, school leavers with higher educated parents, search intensive individuals and school leavers from higher quality institutions. Furthermore, overeducated workers are more often hired in occupations without structural bottleneck vacancies and in the financial and professional services sector. Additionally, irrespective of the used measure, heterogeneous requirements within complexity levels explain a significant but small part of the extent of overeducation.

Address for correspondence: Dieter Verhaest, SHERPPA, Faculty of Economics and Business Administration, Ghent University, Hoveniersberg 24, 9000 Gent; e-mail: Dieter.Verhaest@UGent.be

We thank Bart Cockx, Gerdie Everaert, Freddy Heylen and Dirk Van de gaer for their helpful comments on an earlier draft of this paper. Financial support from the Fund for Scientific Research – Flanders (FWO Vlaanderen), the Flemish Ministries of Science and Technology and Education (PBO 1997 and 1998) and the Federal Public Planning Service Science Policy (Interuniversity Attraction Poles Program - Belgian Science Policy [Contract No. P5/21]) is gratefully acknowledged.

I. Introduction

The importance of education is now generally recognised, not only for social cohesion but also as a crucial determinant of sustained economic growth (see e.g. Storesletten and Zilibotti (2000)). Investments in education have risen in most industrialised countries. As a result, educational levels of the population in general and school leavers in particular are now much higher than a few decades ago. Parallel to this evolution, there have been growing concerns about overeducation. Today an extensive literature on overeducation exists. Estimates for different countries range from 10% to more than 40% (Groot and Maassen van den Brink (2000)). Although most of the literature focuses on the relationship between overeducation and earnings, a lot of articles also pay attention to the determinants of overeducation[1]. While different measures for overeducation are used in the literature, only McGoldrick and Robst (1996) and Giret and Hatot (2001) have estimated the determinants of overeducation based on more than one measure. Their results for some of the explanatory variables are clearly different over the applied measures. This suggests that the outcome of the analysis of the determinants of overeducation often tells more about the applied measurement than about the real factors determining overeducation[2].

Relying on three different measures, we analyse the determinants of overeducation in the first job after leaving school within a search theoretical framework. Through a deeper examination of the outcomes and measures, we try to shed more light on the validity of the measures and to identify the real factors that determine overeducation. The analysis is based on the Flemish SONAR-database, resulting from a survey of 3015 23 year olds about their educational and labour market career. These data give us the opportunity to analyse overeducation on the basis of (1) job analysis, (2) the required educational level to get the job and (3) realised matches. The article is structured as follows. In section II we deal with our theoretical framework and formulate some hypotheses. The measurement of overeducation is discussed in section III. Section IV presents the data. The empirical model is described in section V. The results of the empirical analysis are outlined in sections VI, VII and VIII. Finally, in section IX, we draw some conclusions.

---

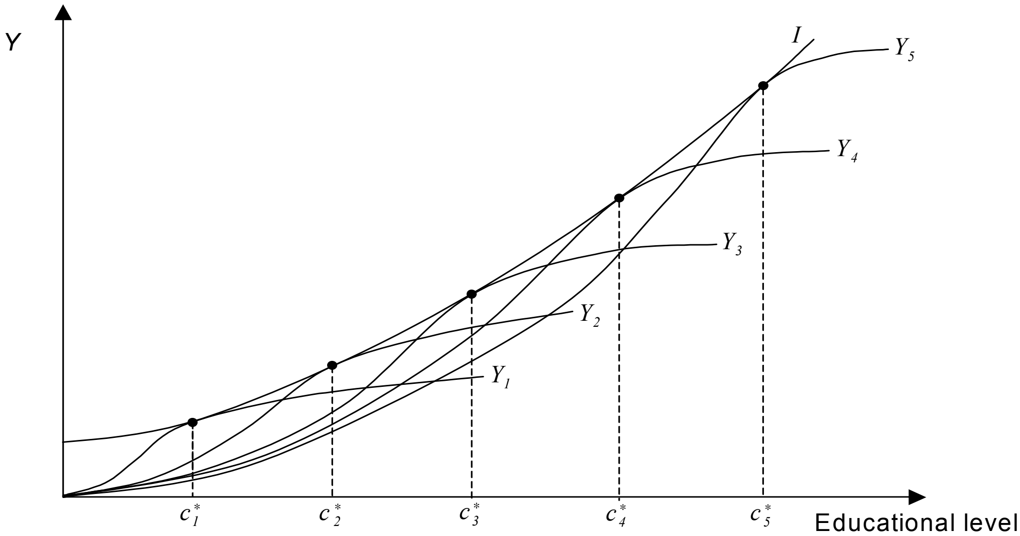
[1] The following authors pay at least part of their attention to the determinants of overeducation: Alba-Ramírez (1993), Robst (1995), McGoldrick and Robst (1996), Groot (1996), van der Meer and Wielers (1996), Sloane et al. (1996, 1999), Battu et al. (1999), Battu and Sloane (2000, 2002), Dolton and Silles (2001), Büchel and Pollmann-Schult (2001), Lassibille et al. (2001), Giret and Hatot (2001) and Chevalier (2003).

[2] Related to this problem is the influence of the measurement when analysing the impact of overeducation (see Verhaest and Omey (2004)).

II. Theoretical framework and hypotheses to be tested

An individual can be defined as being overeducated if his educational level exceeds the minimal required education to do his/her job (i.e. its complexity level). However, there are some conceptual problems with this definition. Firstly, in a pure human capital framework, the concept of overeducation may be meaningless (Green et al. (1999), Sloane (2003)). According to human capital theory, markets are fully efficient. As a consequence, there should be no overinvestments in schooling. However, search frictions and information externalities may lead at least to a temporary mismatch. Furthermore, institutional rigidities make labour markets quite rigid. Secondly, formal education is an incomplete measure of total human capital. Overeducation may compensate for lower quality of education, for example due to differences in quality of institutions or study results. Overeducation can also be permanent if it compensates for lower ability or a depreciation of skills. Undereducation may simply follow from additional experience or on-the-job training. Thus, a clear distinction has to be made between educational and skill mismatches (see e.g. Allen and van der Velden (2001)). In this paper we always use the concept of overeducation in the meaning of educational mismatches: when the formal educational level exceeds the complexity level. Thirdly, this definition starts from a discrete production function for each type of jobs with some threshold educational level that is necessary to be productive. Following Knight's (1979) specification of occupational productions functions, it would be more general to assume a continuous function with (initially increasing and then) decreasing marginal returns to schooling (cf. figure). Thus it makes more sense to define the complexity level by the optimal educational level: given an indifference curve *I* that reflects the educational costs (cf. Mincer (1974)), jobs of type *k* and production function Y_k have complexity level c_k^*.

This definition and productivity pattern is compatible with an approach of skill mismatches as over- or underinvestments in skills. It is intuitive that, compared to a secondary education school leaver, a university graduate is much more productive in a management function, but only slightly more productive in a lower clerical position. It is also in line with the stylised fact of the literature on overeducation and earnings that the return to overeducation is positive but smaller than the return to required education (cf. Hartog (2000)). However, it remains puzzling why the penalty for undereducation is generally lower than the return to required education and often not significantly different from zero. A plausible explanation is that undereducation not reflects a mismatch of skills (cf. supra). An employer will only offer a job to an undereducated school leaver if (1) the job seeker possesses enough additional skills that compensate for the lack of formal education skills or (2) he is not able to find a higher educated job seeker for a vacant position. In this last case, there will be a strong incentive to compensate the underinvestment in formal education skills by additional formal or informal training[3]. Nevertheless, it is remains unclear how the optimal educational level can be derived for each complexity type of jobs. We cannot simply observe this complexity level from reality in the case of rigid and inefficient working markets. Additionally, the optimal level will differ from a private or social point of view. As will be shown in sections III and V, the problem of translating each complexity type *k* into an optimal level can be bypassed when analysing the determinants of overeducation.



Essentially, what we are interested in is what determines whether a school leaver gets and accepts an offer for a job of type *k* and complexity level c_k^*. Search theory delivers an attractive way to model this decision process. It starts from the assumption that job seekers have a minimal acceptable wage offer, the reservation wage. This framework can be easily translated to a model in which individuals not search for a minimal acceptable wage, but a minimal acceptable complexity level, the reservation level. Since wages are positively related to the complexity level, this is compatible with wage maximizing behaviour (Hartog (2000)). Following Mortensen (1986), the reservation complexity level can be written as:

$$(1.1) \quad c^r = f_1(\lambda_1, \mu_1, \sigma_1^2, w_1, \tau_1, s_1, r_1)$$

The reservation level c^r is a positive function of the rate of job offers λ_1, the mean of the complexity offer distribution μ_1, its variance σ_1^2, the opportunity cost of work w_1, the time

[3] In line with this, Beneito et al. (2002) found that training compensates part of the penalty for undereducation.

left until the liquidity constraint becomes binding τ_1 and a negative function of the cost of search s_1 and the interest rate r_1. A higher reservation level corresponds to a higher probability of occupying a more complex job and, controlling for the educational level, a lower probability of being overeducated. Differences in the offer arrival rate and mean offered level will in the first place result from differences in human capital. In the case of imperfect information about the workers' productivity, also signalling arguments will play a role. Finally, differences in these parameters may also result from subjective elements such as taste discrimination.

Based on this search framework, we formulate some hypotheses that will be tested in the empirical analysis:

(H1) Higher qualified individuals occupy higher complexity jobs. Their higher productivity will lead to a higher offer arrival rate and higher mean level of the offered jobs. Education may also function as a signal for ability (Arrow (1972), Spence (1972)) or trainability (Thurow (1975)), what leads to a similar expectation.

(H2) School leavers with better study results and (H3) from higher quality institutions have a lower probability of being overeducated. School leavers with better study results may have a higher level of human capital and thus a higher offer arrival rate and mean offered level. Study results and certificates from higher quality institutions may also be used as a signal for ability or trainability by employers.

(H4) Women and (H5) non-whites have a higher probability of being overeducated. Women have a higher probability of quitting or interrupting their job, what causes productivity losses. For young female job applicants, employers may especially fear interruptions for pregnancy or parental leave. According to statistical discrimination theories (Phelps (1972), Arrow (1973)), employers will use the sex of the job seeker as a signal for his/her future productivity. Taste discrimination (Becker (1975)) will have a similar effect. Anti-discriminatory policy often prevents employers from paying lower wages and using different hiring standards. However, it is difficult to enforce equal effective employment opportunities (Renes and Ridder (1995)), especially if there are multiple applicants. Additionally, taste discrimination will not lead to loss of efficiency in this case (Thurow (1975))[4]. Similarly, taste discrimination will also lead to a lower offer arrival rate and a lower mean level of the offered

[4] Two additional effects may play a role for married women. We do not take them under consideration since the number of married women and women with children is negligible at the start of the first job. Frank (1978) states that married women are more likely to be overeducated since their search is spatially constrained if the family residence is determined by the man. Otherwise, women with children may have a higher preference for homework activities (Gronau (1974)).

jobs among non-whites.

(H6) Individuals with higher educated parents are less often overeducated. Although school leavers are inexperienced job seekers, they can partly avoid the costs of search by pooling information. We expect that individuals with highly educated parents and more social capital have more information on available jobs and thus a higher job arrival rate. Individuals with highly educated and wealthy parents also face less credit constraints.

(H7) The probability of being overeducated is lower among search intensive individuals. A higher search intensity leads to a higher offer arrival rate.

The previous search framework highlights overeducation from a supply side point of view. Similarly, we can also construct a search framework that determines whether an employer gets and hires a young job applicant with a particular educational level. While the school leaver is interested in the offered wage, the employer is rather interested in the productivity of the applicant. Supposing that expected productivity is positively related to the educational level of the worker (cf. figure), employers may a priori determine a reservation educational level e^r below which they won' t hire any school leaver:

(1.2) $$e^r = f_2(\lambda_2, \mu_2, \sigma_2^2, w_2, \tau_2, s_2, r_2)$$

With the rate at which job seekers apply for the job λ_2, the mean of the expected productivity offer distribution μ_2, its variance σ_2^2, costs associated with the match such as the wage w_2, a liquidity constraint variable τ_2, the cost of search s_2 and the interest rate r_2. A higher reservation educational level corresponds to a higher probability of hiring a higher educated school leaver and thus, controlling for the complexity level, a higher probability that the hired applicant is overeducated for the job.

The following demand side hypotheses will be tested:

(H8) Higher complexity jobs more often rely on higher qualified workers. The mean expected productivity of higher educated workers is positively related to the complexity of the job.

(H9) The probability of hiring an overeducated worker is lower in occupations with structural bottleneck vacancies. Jobs require different tasks and worker productivity at those tasks is largely different (Sattinger (1993)). Hence, the likelihood of hiring an overeducated worker for a job will depend on the supply and demand conditions of the type of required skills. In the case of structural bottleneck vacancies, employers will have to downgrade their selection requirements, due to a lower application rate.

(H10) The probability of hiring an overeducated worker is higher in large organizations. Van

der Meer and Wielers (1996) state that large organizations face more difficulties to measure the contribution of the individual worker and thus have a larger incentive to rely on educational credentials. There may also be other reasons why large firms more often hire overeducated workers. They may have lower vacancy costs due to economies of scale and face less liquidity constraints. Furthermore, they have more promotion opportunities. This not only results in a higher application rate, but also in a higher expected mean productivity since they face less productivity losses due to quits of overeducated workers.

(H11) The probability of hiring an overeducated worker is higher in the financial and professional services sector. Since the quality of the product is hard to measure in these sectors, firms will have to build a trust relationship with their clients. Educational credentials of the workers will not only serve as an indicator for productivity, but also as a legitimation to their clients (van der Meer and Wielers (1996)).

III. The measurement of overeducation

Following the definition in the previous section, overeducation can be measured by a comparison of the educational level of the worker e^* and the complexity level of the job c^*. There may be a large heterogeneity in skills of individuals with a similar educational background. Some authors (Green et al. (1999), Chevalier (2003)) indeed found that overeducated workers are less able in comparison with rightly educated workers with a similar schooling. By defining overeducation in terms of educational mismatches, we concentrate on the measurement of the complexity level. Although also observed educational levels may be subject to some measurement error, the measurement of c^* is much more problematic. Broadly speaking three ways of measuring the complexity level have been adopted in the literature. A first method measures c^* by job analysis (e.g. Rumberger (1987)) (JA). This is an objective approach based on the evaluation of required schooling by job experts, which classify the job in an occupational classification. Secondly, a more subjective approach is to ask respondents in a survey what minimal level of education is required to get (e.g. Duncan and Hoffman (1981)) or to do (e.g. Hartog and Oosterbeek (1988)) their job (RL). A last method derives c^* from realised matches (RM). Required education is measured by the average (e.g. Verdugo and Verdugo (1988)) or mode (e.g. Kiker et al. (1997)) educational level in a certain occupation. Chevalier (2003) adopted an alternative approach by defining objectively overeducated who are not satisfied with their job as being genuinely overeducated. Those classified as being overeducated but reporting to be satisfied with their match were classified as being apparently overeducated.

Each measure has its shortcomings and we distinguish three types of measurement error. For simplicity, suppose that e^* and c^* are continuous variables. Following our search theoretical framework, the complexity level c_i^* of the accepted job of school leaver *i* depends on his educational level e_i^* and other individual characteristic x_i (2.1). Similarly, the educational level e_j^* of the hired applicant for job *j* depends on complexity level c_j^* and job characteristic y_j (2.2). Finally, suppose that c^* is related to its measure c^m following (2.3):

(2.1) $c_i^* = z_1 + a_1 e_i^* + b_1 x_i + u_{1i}$

(2.2) $e_j^* = z_2 + a_2 c_j^* + b_2 y_j + u_{2j}$

(2.3) $c_t^m = c_t^* + z^m + b_1^m x_t + b_2^m y_t + u_t^m \qquad t \in \{i, j\}$

A first type of error u_t^m is a simple random measurement error with zero mean and variance σ_m^2. It is difficult to think of any economic or social indicator that is fully free of random error, due to the typical problems accompanied with data collection and processing. Thus, also the measurement of the job level will be subject to it. The classification of jobs by JA is not straightforward. Additionally, there may be a substantial heterogeneity of requirements within a similar job if the classification is based on more aggregate occupations (Halaby (1994)). Contrary, the worker can draw on detailed information of the characteristics of the job in his assessment of the required level to do his job. However, there is a lack of uniform coding instructions (Hartog (2000)). Some may report current hiring standards or their own skill or educational level (Chevalier (2003)), others the median educational level of identical workers in the firm. This is also the case if surveys ask to the required level to get the job. Additionally, the formal vacancy requirement often differs from the real required level for recruitment. Since the RM measure is also based on an occupational classification, the problems are similar to the JA measure. However, the heterogeneity of jobs within occupations will be much more problematic since a certain level of aggregation is necessary to keep enough observations within each occupation.

The second type of error z^m leads to a systematic over- or underestimation of the complexity level for every observation. Also for job experts it remains difficult to translate each complexity type of jobs into an optimal educational level. Furthermore, it is often claimed that skill-biased technological change leads to a general upgrading of skill requirements and thus to systematic underestimation of the complexity level measured by JA. Hence, the complexity level has to be redefined from time to time. Contrary, it is generally argued that measures based on RL systematically overestimate complexity levels. Employers will upgrade hiring standards in response to rising educational attainment of job applicants. Falling private educational costs over time, due to government subsidisation, lead to a rise in the private optimal level, without changing the social optimal level. Additionally, individuals tend to inflate the status of their own position (Hartog (2000)). The mean educational level may be a good estimate of the private optimal level only if labour markets are flexible and efficient. Otherwise, RM will systematically over- or underestimate the complexity level.

The third type of errors b_1^m and b_2^m also lead to a systematic bias of the job level, but only conditional on the value of respectively *x* and *y*. Technological change may occur at a different rate for alternative types of jobs and make some of them even more simple. Hence, the bias of the complexity level will also be related to the characteristics of the job. Workers' assessment of the required level (RL) will be biased by the selection and screening behaviour of employers. Hence, apart from the second type error, complexity levels will be upwardly biased for jobs that rely more on educational credentials (cf. supra). The bias will not only be related to the characteristics of the job, but also to those of the worker. Individuals may tend to evaluate general educational requirements towards their own educational level. Furthermore, workers may report personal requirements instead of general requirement. Finally, social desirability bias may be higher for individuals with a relatively worse labour market position. It follows from these three arguments that groups of workers with a higher probability of being overeducated may overstate more often the complexity level of their job. Also the bias of the RM measure will be related to differences in hiring standards since it influences the average or mode educational level within occupations.

To what extent do these different types of measurement error influence the analysis of the determinants of overeducation? From (2.1) - (2.3) it follows that:

(2.4) $$c_i^m = \left(z_1 + z^m\right) + a_1 e_i^* + \left(b_1 + b_1^m\right)x_i + b_2^m y_i + \left(u_{1i} + u_i^m\right)$$

(2.5) $$e_j^* = \left(z_2 - a_2 z^m\right) + a_2 c_j^m + \left(b_2 - a_2 b_2^m\right)y_j - a_2 b_1^m x_j + \left(u_{2j} - a_2 u_j^m\right)$$

The first type of measurement error only influences the results in equation (2.5). This will bias the coefficients of the complexity level downward and usually also lead to some bias in the coefficients of the other explanatory variables (Verbeek (2000)). The second measurement error type does not cause serious problems since we are mainly interested in the value of parameters b_1 and b_2. The main implication of the first two measurement types is to influence the incidence of over- and undereducation. A systematic and general overestimation of the complexity level ($a^m > 0$) will lead to an overestimation of the incidence of overeducation and an underestimation of the incidence of undereducation. The opposite effect will occur in the case of systematic underestimation ($a^m < 0$). Additionally, it is often suggested that the heterogeneity of educational requirements within an identical measured job level ($\sigma_m^2 > 0$) leads to an overestimation of the incidence of over- as well as undereducation. This will indeed be the case if over- and undereducation can be regarded as exceptional situations. However, it may just as well lead to an underestimation of the incidence of overeducation if overeducation is rather the rule. Thus, the only thing we can say for sure in the case of random error is that part of the variation in the extent of overeducation may be explained by a heterogeneity of requirements within each measured complexity level. Jobs with relatively more of these unobserved requirements may then have a higher probability of being occupied by overeducated workers. We test the following hypothesis:

(H12) Part of the variation in the extent of overeducation results from a heterogeneity of requirements within measured complexity levels.

The third type of measurement error causes more problems since the bias is related to the variables of interest. This problem will be avoided for JA if the classification scheme is regularly updated. As Hartog (2000) states, there is no reason to expect bias in any particular direction in this case. It has the conceptual advantage to start from the technology of the job. And even if there is no regular update, the problem may be minimized if the classification is flexible and detailed enough. In this case, job experts have the possibility to classify jobs within similar occupations at various complexity types. The bias by the selection and screening behaviour of the employer of the job level based on RL is much more problematic. The true minimal required level to get a job corresponds to the definition of the reservation educational level. Relatively higher objective overeducation among particular jobs will then not show up in the data. Additionally, social desirability will bias downwardly the coefficients for the individual characteristics. Similarly for RM, a concentration of undereducation within a certain occupation, e.g. as a consequence of structural bottlenecks, will lead to a lower measured job level and hence, relatively less measured undereducation for that occupation. The following hypotheses regarding the measurement of overeducation will be tested:

(H13) JA delivers the most consistent results for the analysis of the determinants of overeducation.

(H14) The complexity level based on RL is biased by the selection behaviour of the employer.

(H15) The complexity level based on RM is biased by the extent of over- and undereducation within occupations.

IV. Data and the incidence of overeducation

The empirical analysis is based on the first cohort of the SONAR-database about the transition from school to work in Flanders. At the end of 1999, 3015 randomly chosen Flemish 23 years old were questioned about their educational and early labour market career[5]. We focus on the first job after leaving school, for which we have information on over- and undereducation[6]. Estimating our relations with a sample of school leavers is highly selective. However, one should interpret our observations as coming from a sample of entry jobs, a particular segment in the labour market where mismatch problems are most likely to occur. Additionally, concentrating on the first job has the conceptual advantage that educational mismatches to a large extent correspond to skill mismatches since school leavers do not yet have any on-the-job training or experience (cf. supra). A group of 15.2% still studied at the age of 23, while another 3.9% never had a job. Those with a job entered the labour market over the period 1994-1999. Furthermore, we restrict the analysis to the non-self employed with a job in Flanders (Brussels including). This reduces our sample to maximally 2199 respondents.

The questionnaire was based on a detailed calendar what avoids inconsistencies in the educational and work career. This minimizes measurement error in the educational level. While most studies only compute a single measure of mismatch, we assess over- and undereducation relying on job analysis (JA), the required level to get the job (RL) and realised matches (RM). The JA measure is derived from the 1992 Standard Occupation Classification of the Dutch CBS (1992). This is a detailed classification, based on a five-digit code and five complexity types: elementary, lower, medium, higher and scientific. The corresponding complexity levels are: less than lower secondary (<LS), lower secondary (LS), higher secondary (HS), lower tertiary (LT) and higher tertiary education (HT). To ensure comparability, we also use this educational classification for the computation of the measures based on RM and RL. The RL measure is based on the question: 'To get your job, what educational level were you required to have?'. This question was posed to those who

[5] For an extensive description of the data, we refer to SONAR (2000).

[6] The first job is defined to be the first job of at least one hour a week and a tenure of at least one month.

confirmed that a qualification was required for their job. Also the RM measure is computed from the CBS classification. Since most of occupations at the most detailed level have extremely low frequencies of observations, they are aggregated at the two-digit level. As in Kiker et al. (1997), the complexity level is defined as the modal educational level within the occupation.

Some summary statistics regarding the computation of over- and undereducation can be found in table 1. A majority of the school leavers has a higher secondary degree. Based on JA, employment is relatively equally spread over the several job levels. As expected, the proportion that works at the two highest job levels is larger if the measure is based on RL. On the other hand, in more than 40% of the cases less than a lower secondary qualification was required to get the first job, while a lower secondary degree was minimally required for only 4% of the school leavers. This particular bias may result from the assumption of employers that almost every job seeker has at least a lower secondary qualification with compulsory education until 18 in Flanders. When measured by RM, nobody occupies a job at the two lowest levels. This cohort effect results from the small size of the group of school leavers that enter the labour market without a higher secondary degree. Consequently, none of the two-digit level occupations in the SONAR-database is occupied by a majority of lower educated. The incidence of overeducation (*OVER*) varies between only 12.7% based on RM, 44.5% based on RL and almost 55% based on JA. When measured by RM, the overeducation figure is remarkably small, while the incidence of undereducation is rather large (13,2%). This is consistent with a systematic overestimation of the complexity level. Based on JA, we find a relatively small incidence of undereducation. In section II, we indeed motivated that it is only beneficial to hire an undereducated school leaver under rather exceptional conditions. Finally, the very small incidence of undereducation based on RL is in line with the supposition that the RL level reflects the reservation educational level of the employer (cf. section III).

Table 1*: Some summary statistics*

	Educational level (E)	*Complexity level (C)*		
		JA	RL	RM
(1) <LS	3.3%	16.8%	40.9%	-
(2) LS	5.9%	29.9%	4.0%	-
(3) HS	53.3%	28.0%	22.0%	62.9%
(4) LT	27.3%	20.8%	24.3%	31.0%
(5) HT	10.1%	4.5%	8.9%	5.0%
OVER		54.3%	44.5%	12.7%
UNDER		4.0%	2.6%	13.2%

V. Empirical model

Since we measure the complexity level c_t^* by the ordered response variable $c_t \in \{1,2,3,4,5\}$ and the educational level e_t^* by $e_t \in \{1,2,3,4,5\}$, OLS is inappropriate. Based on an ordered logit model, we estimate the probability that a school leaver *i* with educational level $e_i = l$ and a vector of *n* other individual characteristics $X_i = (X_{1i}, X_{2i}, ..., X_{ni})'$ finds a first job of complexity type *k*. This model can be specified as follows:

$$(3.1) \quad \log\left[\frac{P(c_i \leq k)}{P(c_i > k)}\right] = \theta_k - [\alpha_l E_i + \beta_l X_i + \varepsilon_{1i}] \qquad k \in \{1,2,3,4\}$$

Where $\alpha_l = (\alpha_{l1}, \alpha_{l2}, \alpha_{l3}, \alpha_{l4})$, $\beta_1 = (\beta_{11}, \beta_{12}, ..., \beta_{1n})$ and $E_i = (E_{1i}, E_{2i}, E_{3i}, E_{4i})'$ with all elements equal to zero, except E_{li} = 1. Estimation (3.1) is completely equivalent to the estimation of the determinants of overeducation and the effect of the other characteristics X_i on the probability of overeducation (and undereducation) can be derived for each educational level e_i. A higher probability of finding a more complex job for an individual with a positive value of e.g. characteristic X_{1i} ($\beta_{11} > 0$) is equivalent to a lower (higher) probability of being overeducated (undereducated). This approach is preferred to the often applied multinomial model with dummies for a good match, over- and undereducation since it is in line with our search theoretical framework. Furthermore, this model is not sensitive to any systematic over- or underestimation of the complexity level. Additionally, the problem of translating each complexity type of jobs into an optimal educational level is bypassed. We only have to assume that jobs of type *k* have a lower complexity level than jobs of type *k+1*. It makes JA, starting from the underlying technology of each job, even more attractive. Finally, we would have to exclude the observations for the lowest (highest) educational level since, by definition, they cannot be overeducated (undereducated). Due to a zero cell count, we exclude those with less than a lower secondary degree (e_i = 1) from the analysis based on RM.

The educational level dummies E_l enable us to test (H1). In interaction with a tertiary education qualification ($e_i \in \{4,5\}$), we include two dummies for the study results in the last year (H2). For other educational levels, we have no observations on study results. We also control for the quality of the institution (H3), by including in interaction with a higher tertiary degree (e_i = 5) a dummy for those who obtained their degree at university. University education in Flanders is generally perceived as being of a higher quality than non-university higher tertiary education. Furthermore, we control for gender (H4), race (H5) and the education of the parents by including a dummy for a father with a higher tertiary education (H6). To test for the hypothesis that search intensive individuals have a lower probability of being overeducated (H7), we include two dummies for school leavers who started their search activity respectively within and more than one month before leaving school. The assumption that search intensive and thus motivated individuals also start their search activity earlier seems reasonable. Since the group of school leavers with a higher secondary degree ($e_i = 3$) is very heterogeneous, we include extra dummies for those who (1) obtained their degree in part-time education, (2) obtained an extra part-time education, (3) qualified for an extra seventh year and (4) passed at least one year in tertiary education, without obtaining the final degree. As (H1) predicts, these extra qualifications may raise the likelihood of obtaining a higher complexity job, while a part-time education may lower this likelihood. Finally, we also include educational subject and regional residence dummies to control for differences in preferences and underlying demand and supply conditions.

Similarly, we estimate the probability that for a vacant entry job j with complexity level $c_j = k$ and a vector of m other job characteristics $Y_j = (Y_{1j}, Y_{2j}, ..., Y_{mj})'$ a school leaver with educational level l is hired:

$$(3.2) \quad \log\left[\frac{P(e_j \leq l)}{P(e_j > l)}\right] = \theta_l - \left[\alpha_2 C_j + \beta_2 Y_j + \varepsilon_{2j}\right] \qquad l \in \{1,2,3,4\}$$

Where $C_j = (C_{1j}, C_{2j}, C_{3j}, C_{4j})'$ with all elements equal to zero, except $C_{kj} = 1$. In this model, a higher probability of hiring a better educated school leaver for a job with e.g. characteristic Y_{1j} ($\beta_{21} > 0$) corresponds to a higher (lower) probability of recruiting an overeducated (undereducated) worker. Along with complexity level dummies, that also test for (H8), we include dummies for firm size (H10) and sector of employment (H11). To test the hypothesis that the likelihood of hiring overqualified workers is lower in structural bottleneck vacancy jobs (H9), we include dummies for technical, clerical and socio-cultural professions. According to the Flemish regional employment agency VDAB (2000), during the nineties, bottleneck vacancies were especially concentrated in technical professions. The opposite holds for socio-cultural professions, which had no problems to fill their vacancies. No clear prediction can be made for clerical professions, a heterogeneous group. While there was a permanent shortage of information scientists, there were far less vacancy problems for lower administrative jobs. Finally, we also include dummies for part-time contract, temporary contract and the region of employment as additional control variables.

The first type of measurement error may not only bias the coefficients of the complexity levels downward, but will usually also lead to some bias in the coefficients of the other explanatory variables (cf. supra). To control for the heterogeneous requirements of jobs with an identical measured job level, we construct a job complexity variable based on factor analysis. This factor is constructed from five job skills that are needed to do the job: responsibility, leadership, reading and writing, mathematical and social skills. These skills are general in nature and can be used in almost every type of job or occupation, but make them more complex. The residuals of the regression of this factor on the corresponding complexity levels are included as a determinant in equation (3.2) and may account at least for the random part of the unmeasured heterogeneity of skill requirements. Since individuals may take their colleagues as a reference when answering in surveys on scale questions about requirements of particular skills, it may be less effective to account for measurement errors that are related to the characteristics of the job. The results and statistics of the factor and regression analysis are reported in Appendix B. We expect that jobs with more of these unmeasured skill requirements have a higher probability of being occupied by overeducated workers[7]. This test can be seen as a test for the opposite side of the story told by Chevalier (2003). He controlled for the heterogeneity in the skills of graduates by including a proxy for unobservable skills and showed that part of the variation in measured overeducation is explained by these unobserved skills. We test for the hypothesis that part of the variation in measured overeducation is explained by this unmeasured complexity (H12).

The hypothesis that the job analysis measure delivers the most consistent results (H13) is tested by evaluating to what extent hypotheses (H1) to (H11) are confirmed for the analyses based on the various measures. Supposing that JA delivers an unbiased measure for the complexity level and that the RL level measures the reservation educational level $e_j^r \in \{1,2,3,4,5\}$, we have a measure for qualification inflation by comparing this job level with the RL level[8]. A job is characterized by qualification inflation (deflation) if the reservation educational level is higher (lower) than the complexity level. The determinants of qualification inflation can be analysed by estimating the probability that for an entry job j

[7] One way to control for all unobserved heterogeneity is the application of a panel data analysis. However, this requires that jobs remain unchanged over time, what is not realistic.

[8] Green et al. (1999) and Dolton and Silles (2001) used a similar indicator for qualification inflation and deflation, but the functional level was measured by the self-assessed required level to do the job.

with complexity level $c_j = k$ and a vector of other characteristics Y_j minimally qualification r is required to get the job:

$$(3.3) \quad \log\left[\frac{P(e_j^r \leq r)}{P(e_j^r > r)}\right] = \theta_r - [\alpha_3 C_j + \beta_3 Y_j + \varepsilon_{3j}] \qquad r \in \{1,2,3,4\}$$

Where $C_j = (C_{1j}, C_{2j}, C_{3j}, C_{4j})'$ with all elements equal to zero, except C_{kj} = 1. A higher probability that a better qualification is required to get a job with e.g. characteristic Y_{1j} ($\beta_{31} > 0$) corresponds to a higher (lower) probability of qualification inflation (deflation). If the reported required level to get the job indeed corresponds to the reservation educational level, the results for qualification inflation have to be identical to those for overeducation. Thus, we expect that qualification inflation is lower in jobs with structural bottleneck vacancies (H9) and higher in large firms (H10) and the financial and professional services sector (H11). Similarly, the reservation educational level has to be higher for higher complexity jobs (H8). This estimation also delivers a test for the hypothesis that the level measured by RL is biased by the selection behaviour of the employer (H14). If this measure is unbiased, we expect that there is no correlation with the other characteristics ($\beta_3 = 0$).

We could apply the same test procedure for (H15) by using the modal educational level within occupations as dependent variable. However, due to zero cell counts, we have to apply a binary logit model and restrict the analysis to two complexity levels (HS and LT). We estimate the probability that for an entry job j the RM level $m_j \in \{3,4,5\}$ exceeds the complexity level $c_j \in \{3,4\}$:

$$(3.4) \quad \log\left[\frac{P(m_j > c_j)}{P(m_j = c_j)}\right] = \theta + \alpha_4 C_j + \beta_4 Y_j + \varepsilon_{4j}$$

Contrary to equation (3.3), this equation has no economic interpretation. If the RM measure is not affected by the last type of measurement error, then the other characteristics y_j should be unrelated to this probability ($\beta_4 = 0$). In line with (H15), we expect that this probability is higher in technical professions and lower in socio-cultural professions. Of course, the validity of these test procedures depend on the proposition that our JA measure is an unbiased measure for the complexity level.

VI. The determinants of being overeducated

The results of estimation (3.1) are given in table 2. We discuss systematically the various hypotheses formulated in section II regarding the determinants of being overeducated.

(H1) Higher qualified individuals occupy higher complexity jobs. This hypothesis cannot properly be evaluated based on the estimation results in table 2 since some interaction terms with the educational levels were included in the model. We computed the estimated cumulative probabilities for the different educational levels, based on sample mean characteristics (cf. Appendix C). The hypothesis is confirmed by these results: a higher educational level increases the likelihood of getting a higher complexity job, independently of the way the job level is measured[9]. However, there are only small differences between the two lowest levels. This suggest that the market does not distinguish much between individuals who have no higher secondary qualification. An additional part-time qualification, a seventh year degree or at least one completed year of tertiary education for school leavers with a higher secondary degree also increases the likelihood of occupying a higher complexity job as measured by JA (cf. table 2). With the exception of an extra part-time qualification, this is also the case when the job level is defined by RL. No significant effects are found with respect to the RM measure, but a part-time higher secondary qualification, compared to a full-time qualification, leads in this case to a lower likelihood of getting a higher complexity job.

(H2) School leavers with better study results have a lower probability of being overeducated. School leavers with a great distinction degree in the last year of tertiary education have a significant higher probability of obtaining a higher complexity job, irrespective of the measurement of the job level. The relation between study results and overeducation was also examined by Battu et al. (1999) and Dolton and Silles (2001) for British graduate school leavers. The results of Dolton and Silles indicated also that individuals with a first class degree have a lower probability of being overeducated in the first job after leaving school. Battu et al. found a similar negative relation between high study results and the likelihood of being overeducated one year after graduation, but not for all cohorts. Büchel and Pollmann-Schult (2001) found an effect from higher grades on the likelihood of being overeducated even at the age of 27 to 34 for some groups of German workers with certain vocational qualifications.

[9] It may be expected that this result partly follows from the fact that lower and higher educated workers entered the labour market at a different phase in the business cycle. However, the inclusion of year dummies didn't lead to any significant improvement of the model.

(H3) School leavers from higher quality institutions have a lower probability of being overeducated. Having a higher tertiary qualification from university instead of a degree from a non-university institution substantially increases the probability of getting a job with a higher complexity level, but the relation is not significant when this level is defined as the required level to get the job. The relation between school quality and overeducation is confirmed by the research of Robst (1995) which is based on more refined quality measures.

(H4) Women have a higher probability of being overeducated. Controlling for the educational level, women have a significant lower probability of occupying a higher complexity job based on JA. This implies a higher probability of being overeducated. However, this hypothesis is not confirmed in the estimations for the other measures. Also Dolton and Silles (2001) and Giret and Hatot (2001) didn't find a significant effect based on a self assessment measure for respectively British and French female school leavers. Furthermore, like Lassibille et al. (2001) for Spanish school leavers, Giret and Hatot (2001) also found a higher probability of being overeducated for the first job based on JA. Alternatively, Chevalier (2003) didn't find any significant effect. However, comparisons with this study are complicated by the alternative definition of overeducation (cf. supra)[10]. Also comparisons with other research are difficult since the relation between gender and overeducation is theoretically less clear for the whole labour force. Furthermore, most of the studies do not control for educational subjects, while educational and occupational segregation largely influences differences in over- and undereducation among men and women.

(H5) Non-whites have a higher probability of being overeducated. Also non-whites have a significant lower probability of occupying a higher complexity level job based on JA. Again, the effect is insignificant for the measure based on RL and positive but not significant at the 5% level for the RM measure. Battu and Sloane (2002) examined the relation between ethnic background and overeducation in more detail and found that the incidence of overeducation is lower among whites, but varies substantially among ethnic minorities in Britain.

(H6) Individuals with higher educated parents are less often overeducated. School leavers with a father who has a higher tertiary qualification indeed have a lower probability of being overeducated. However, the relation is not significant when the job level is measured by RL. Again, Giret and Hatot (2001) found similar results: a significant lower probability of being overeducated based on JA among school leavers with a higher educated father, but an

[10] Additionally, the objective definition of overeducation is based on a very rudimentary classification using the 2-digit Standard Occupation Code, what makes this measure much more sensitive to potential biases (cf. supra).

insignificant effect based on self assessment. Furthermore, the relation between the schooling of the father and overeducation based on self-assessment was also insignificant in the research of Büchel and Pollmann-Schult (2001). Lassibille et al. (2001) controlled for the father's occupation and the mother's employment status instead of the educational level of the parents, but didn't find any effect.

Table 2*: The determinants of finding a job with complexity level k (equation (3.1)): Ordered logit coefficients and standard errors (in parentheses)*

Job level measurement	JA	RL	RM
Threshold θ_k			
(1) <LS	-5,291 ** (,393)	-7,542 ** (,490)	-
(2) LS	-3,284 ** (,387)	-7,289 ** (,489)	-
(3) HS	-,737 * (,375)	-5,170 ** (,480)	-2,569 ** (,453)
(4) LT	2,631 ** (,388)	-,874 * (,436)	2,082 ** (,430)
Educational level E_i			
(coefficient α_l*)*			
(1) <LS	-5,048 ** (,443)	-9,287 ** (,602)	-
(2) LS	-4,942 ** (,415)	-9,177 ** (,543)	-6,520 ** (,734)
(3) HS	-4,359 ** (,394)	-8,042 ** (,492)	-5,777 ** (,510)
(4) LT	-1,377 ** (,408)	-4,189 ** (,507)	-2,520 ** (,472)
(5) HT (ref.)			
Background			
Woman	-,239 ** (,088)	-,125 (,101)	,226 (,136)
Non-white	-,393 * (,194)	-,175 (,240)	,647 (,353)
HT father	,316 * (,146)	,245 (,168)	,447 * (,184)
Search behaviour			
< 1 month before	,345 ** (,106)	,227 (,120)	,279 (,162)
> 1 month before	,403 ** (,124)	,291 * (,141)	,171 (,170)
*Study results*TE*			
Great distinction	1,071 ** (,268)	,947 ** (,348)	,992 ** (,300)
Distinction	,216 (,153)	,128 (,174)	,186 (,176)
*Qualifications*HS*			
Part-time	-,173 (,195)	-,073 (,225)	-2,071 * (1,03)
Extra Part-time	,644 * (,282)	,452 (,301)	,027 (,466)
Seventh year	,461 ** (,140)	,564 ** (,151)	,082 (,276)
Not finished TE	,604 ** (,205)	,611 ** (,213)	,407 (,293)
*Qualifications*HT*			
University	1,364 ** (,316)	,555 (,384)	1,174 ** (,339)
Chi²	1722,2**	2154,5**	1634,7**
-2 Log Likelihood	2959,6	2475,3	1279.2
Deg. of freedom	29	29	28
N	2152	2095	2080

Also included but not reported: educational subject*HS (3 dummies); educational subject*LT (5 dummies); educational subject*HT (2 dummies); regional residence (4 dummies). TE = tertiary education (LT or HT).
*: significant at the 5% level, **: significant at the 1% level.

(H7) The likelihood of being overeducated is lower among search intensive individuals. This hypothesis is clearly confirmed with respect to the JA and RL measure. School leavers who start their search activity more than one month before the end of their school career have a significant higher probability of obtaining a higher complexity job. However, no significant relation is found based on RM.

VII. The determinants of hiring an overeducated worker

Table 3 reports the results with respect to equation (3.2). We considered the following hypotheses regarding the determinants of hiring an overeducated school leaver:

(H8) Higher complexity jobs more often rely on higher qualified workers. Compared to (H1), this hypothesis can be seen as the opposite side of the same coin. Independently of the way the complexity levels are measured, higher complexity jobs more often rely on higher qualified workers. Also here, we computed the estimated cumulative percentages for the different levels (cf. Appendix C). The difference is almost negligible between the two lowest complexity levels measured by RL. This suggest that there is little difference in complexity between the two lowest job levels when measured by this measure. In more than 80% of the cases where no educational qualification was required, still a school leaver with a higher secondary qualification was recruited.

(H9) The probability of hiring an overeducated worker is lower in occupations with structural bottleneck vacancies. Controlling for the complexity level, technical professions have only the lowest probability of being occupied by better educated workers in the regression based on JA. The opposite result can be expected for occupations without any problems with bottleneck vacancies. Socio-cultural occupations have indeed the highest probability of hiring better qualified workers. This conclusion holds for every measure. Other authors as well, such as Battu et al. (1999) and Dolton and Silles (2001), controlled for occupations, but they didn't link their results to structural bottleneck vacancies.

(H10) The probability of hiring an overeducated worker is higher in large organizations. The proposition of van der Meer and Wielers (1996) that large organizations rely more often on higher qualified workers is confirmed for all measures. However, this relationship is less strong when the complexity level is measured by RL. This hypothesis was also confirmed by the research of, among others, Battu et al. (1999), Dolton and Silles (2001)

and Giret and Hatot (2001). By contrast, Battu and Sloane (2002) didn't find such a relationship, but their overeducation measure was based on the required level to get the job.

***Table 3**: The determinants of hiring a school leaver with educational level l (equation (3.2): Ordered logit coefficients and standard errors (in parentheses).*

Job level measurement	JA			RL			RM		
Threshold θ_l									
(1) <LS	-11,588	**	(,531)	-12,926	**	(,483)	-10,668	**	(,441)
(2) LS	-10,386	**	(,521)	-11,737	**	(,472)	-9,496	**	(,429)
(3) HS	-6,000	**	(,501)	-7,097	**	(,450)	-5,258	**	(,410)
(4) LT	-2,598	**	(,481)	-2,081	**	(,409)	-2,053	**	(,393)
Complexity level C_j									
(coefficient α_2)									
(1) <LS	-9,299	**	(,504)	-10,450	**	(,424)	-		
(2) LS	-8,380	**	(,481)	-10,317	**	(,491)	-		
(3) HS	-6,763	**	(,469)	-9,335	**	(,418)	-7,263	**	(,370)
(4) LT	-4,365	**	(,447)	-5,558	**	(,377)	-3,918	**	(,346)
(5) HT (ref.)									
Firm-size									
Unknown	-,579	*	(,256)	-,430		(,283)	-,794	**	(,255)
Small	-,759	**	(,161)	-,450	*	(,184)	-,707	**	(,162)
Medium	-,289	*	(,138)	-,115		(,162)	-,302	*	(,140)
Large (ref.)									
Occupation									
Technical	-,722	**	(,189)	,013		(,161)	,320	*	(,152)
Clerical	,704	**	(,173)	1,055	**	(,178)	,421	**	(,153)
Socio-cultural	1,103	**	(,292)	1,405	**	(,382)	,590	*	(,300)
Other (ref.)									
Sector									
Unknown	,107		(,355)	,193		(,399)	-,280		(,353)
Primary	,074		(,473)	-,230		(,503)	-,518		(,475)
Industry	,404		(,212)	-,071		(,234)	-,409	*	(,201)
Construction	,419		(,289)	-,062		(,315)	-,293		(,285)
Commerce	,302		(,223)	,068		(,247)	-,362		(,215)
Catering	,157		(,279)	,035		(,305)	-,349		(,278)
Transport and Commun.	,067		(,272)	,121		(,310)	-,500		(,272)
Finance	,922	**	(,310)	-,182		(,384)	,018		(,303)
Professional Services	,671	**	(,238)	,111		(,275)	,240		(,233)
Government	-,261		(,335)	-,303		(,381)	-,495		(,333)
Education	,202		(,225)	,899	**	(,277)	,295		(,220)
Other Services	,245		(,309)	,361		(,356)	,067		(,303)
Health Care (ref.)									
Unmeasured complexity	,248	**	(,061)	,216	**	(,067)	,383	**	(,060)
Chi² (complexity levels)	944,8	**		1566,2	**		866,4	**	
Chi² (unm. complexity)	16,3	**		10,3	**		40,8	**	
Chi² (model)	1748,4	**		2340,3	**		1674,4	**	
-2 Log Likelihood	3399,6			2704,2			3473,6		
Deg. of freedom	29			29			27		
N	2145			2091			2145		

Also included but not reported: dummies for part-time contract (1), temporary contract (1) and region of employment (4). *: significant at the 5% level, **: significant at the 1% level.

(H11) The probability of hiring an overeducated worker is higher in the financial and professional services sector. In the estimation based on the JA measure, jobs in the financial and professional services sector have the highest likelihood of being occupied by higher educated workers. However, this hypothesis cannot be confirmed when the analysis is based on RL or RM. The analysis of Battu and Sloane (2002), based on the required level to get the job, also didn't confirm this proposition. Although not explicitly testing this hypothesis, based on a RM measure, Groot (1996) didn't find evidence that overeducation is especially concentrated in the banking, finance, insurance and business services sector either. Contrary, van der Meer and Wielers (1996) based the test that confirmed their hypothesis on a JA measure.

VIII. The validity of the overeducation measures

In this section, we analyse the validity of the applied measures in further detail. The evaluation of the first two hypotheses are based on the previous analysis. For the last two hypotheses, we executed some additional estimations (cf. table 4).

(H12) Part of the variation in the extent of overeducation results from a heterogeneity of requirements within measured complexity levels. Jobs that require more of the skills measured by the included unmeasured complexity factor more often rely on overeducated workers (cf. table 3). The effect is robust and highly significant for all of the three applied measurement methods. As argued in section III, this heterogeneity of skill requirements within measured complexity levels does not necessarily lead to an overestimation of the incidence of over- and undereducation. Furthermore, chi² statistics suggest that this unmeasured complexity only contributes to a very small part of explained variance compared to measured complexity levels.

(H13) JA delivers the most consistent results. Only four out of eleven hypotheses ((H1), (H2), (H8) and (H10)) are clearly confirmed by the empirical results for all of the measures we applied. Additionally, the results of the analysis based on RL are in line with (H7) and those based on RM with (H3) and (H6). However, all of the hypotheses are confirmed by the analysis based on JA. Hence, JA clearly delivers the most consistent results. Although the value of this test depends on the validity of the theoretical considerations, the small ability of the RM and RL measure compared to the JA measure to corroborate these hypotheses is remarkable.

Table 4: *The validity of the overeducation measures (equation (3.3) and (3.4)): coefficients and standard errors (in parentheses)*

	Qualification inflation (equation (3.3), ordered logit)			RM level > Complexity level (JA) (equation (3.4), binary logit)		
Threshold (θ_r)						
(1) <LS	-8,214	**	(,431)	-		
(2) LS	-7,912	**	(,429)	-		
(3) HS	-5,918	**	(,419)	-		
(4) LT	-2,598	**	(,391)	-		
Intercept (θ)	-			-7,539	**	(,801)
Complexity level C_j						
(1) <LS	-9,498	**	(,428)	-		
(2) LS	-7,896	**	(,389)	-		
(3) HS	-6,056	**	(,376)	6,681	**	(,607)
(4) LT (ref. equation (4))	-3,730	**	(,348)	-		
(5) HT (ref. equation (3))						
Firm-size						
Unknown	-,420		(,268)	-,121		(,912)
Small	-,490	**	(,155)	-,318		(,470)
Medium	-,325	*	(,133)	-,357		(,407)
Large (ref.)						
Occupation						
Technical	-,568	**	(,180)	-4,674	**	(,719)
Clerical	,003		(,164)	4,003	**	(,521)
Socio-cultural	,552		(,288)	5,655	**	(,789)
Other (ref.)						
Sector						
Unknown	-,585		(,367)	-,406		(,937)
Primary	-2,086	**	(,810)	-		
Industry	,094		(,209)	1,776	**	(,542)
Construction	,371		(,276)	,201		(1,42)
Commerce	-,574	**	(,221)	1,440	*	(,633)
Catering	-,576	*	(,281)	-1,777		(1,18)
Transport and Communic.	-,492		(,264)	-,930		(,636)
Finance	,804	**	(,300)	,428		(,882)
Professional Services	,364		(,233)	-,097		(,618)
Government	-,181		(,320)	-,407		(,682)
Education	-,223		(,222)	-,304		(,992)
Other Services	-,522		(,294)	-,488		(,615)
Health Care (ref.)						
Unmeasured complexity	,490	**	(,062)	,396		(,212)
Chi² (complexity levels *C*)	1097,7	**		372,7	**	
Chi² (unmeasured complexity)	63,0	**		3,6		
Chi² (model)	1991,8	**		835,4	**	
-2 Log Likelihood	3765,0			344,7		
Deg. of freedom	29			25		
N	2075			1048		

Also included but not reported: dummies for part-time contract (1), temporary contract (1) and region of employment (4). *: significant at the 5% level, **: significant at the 1% level.

(H14) The functional level based on RL is biased by the selection behaviour of the employer.

As expected, qualification inflation is especially concentrated in large firms and the finance sector, while qualification deflation is more prevalent in technical occupations (cf. table 4, equation (3.3)). Similarly, lower complexity levels have also a lower minimal required level. The predictions for qualification inflation are thus similar to those for overeducation and give further support to (H8) – (H11). The reported minimal required level can thus serve as an imperfect measure of the reservation educational level[11]. These results explain why the hypothesis about the concentration of overeducation in occupations without bottleneck vacancies (H9) and the financial and professional services sector (H11) could not be confirmed when the analysis was based on the required level to get the job. It is also clear why the relation between overeducation and firm size (H10) was less strong in this case. Furthermore, this may explain why Battu and Sloane (2002) couldn't find evidence for the credentials hypothesis of van der Meer and Wielers (1996) either. Again, we computed the estimated cumulative probabilities for each complexity level (cf. Appendix C). Qualification deflation is especially concentrated at the lower secondary job level. Employers may not specify any qualification requirement since almost every job seeker has at least a lower secondary qualification. Indeed, more than 90% of the vacancies at this level are even filled by school leavers with more than a lower secondary qualification (cf. supra). Another interesting finding from our analysis is that qualification inflation is higher in jobs with more unmeasured skill requirements. Thus, the measure based on RL partly corrects for the heterogeneity of skill requirements within complexity levels measured by JA.

(H15) The functional level based on RM is biased by the extent of over- and undereducation within occupations. Parallel to this hypothesis, the probability that the functional level measured by RM exceeds the objective job level is higher in jobs for socio-cultural and lower in jobs for technical professions (cf. table 4, equation (3.4)). Hence, the lack of evidence for the hypothesis that overeducation is less concentrated in technical professions (H9) when a realised matches measure is applied is not surprising. Furthermore, some sectors of employment such as education and health care largely coincide with certain occupations such as teachers and nurses. This fact may explain why also the sector part of the credentials hypothesis of van der Meer and Wielers (1996) was not confirmed when the analysis was based on a RM measure. Contrary to the RL level, the RM level does not correct for the heterogeneity of skills within the levels measured by JA. This is logical since both measures are based on the same classification (cf. supra). Additionally, it supports the supposition of (H13) that the JA levels are unbiased. Otherwise, we would expect that the modal educational level partly corrects for the bias caused by technological change.

---

[11] This is also illustrated by the following test: Regressing educational levels on RL levels (cf. model 3.2) delivers an adj. R^2 of 0,72. Further inclusion of the other explanatory variables raises this statistic to only 0,74.

IX. Conclusions

Based on three measures, we analysed the determinants of overeducation in the first job after leaving school within a search theoretical framework. This enabled us to shed more light on the validity of the measures and to identify the real factors that determine overeducation. The following conclusions can be made:

(1) The outcome of the analysis of the determinants of overeducation depends to a large extent on the way over- and undereducation is measured. Few results are robust over the three measures: while all of the eleven formulated hypotheses are confirmed in the case of job analysis, only five hypotheses are confirmed when overeducation is measured by the required level to get the job and six when measurement is based on realised matches. Hence, job analysis clearly delivers most consistent results (H13).

(2) The required level to get the job is biased by the selection behaviour of the employer (H14), while the functional level based on realised matches is biased by the extent of over- and undereducation within occupations (H15). This explains to a large extent why the estimated determinants of overeducation measured by these two measures are not always in line with expectations based on theoretical considerations.

(3) The following hypotheses are confirmed, irrespective of the applied measure: (H1) higher qualified individuals occupy higher complexity jobs, (H2) the likelihood of being overeducated is lower among school leavers with better study results, (H8) higher complexity jobs more often rely on higher qualified workers and (H10) the probability of hiring an overeducated worker is higher in large organizations.

(4) Based on the job analysis measure, we find in addition evidence for the other hypotheses: the likelihood of being overeducated is lower among (H3) individuals from higher quality institutions, (H4) men, (H5) whites, (H6) individuals with higher educated parents and (H7) search intensive individuals, the likelihood of hiring an overeducated worker is higher in (H9) occupations without bottleneck vacancies and (H11) the financial and professional services sector.

(5) The analysis indicates that, irrespective of the applied measurement procedure, part of the variation in the extent of over- and undereducation is explained by a heterogeneity of skill requirements within measured complexity levels. However, the explained variance of this heterogeneity is rather small.

This paper clearly shows both formally and empirically that the choice of the measure for overeducation is crucial for the outcome of the analysis. Results in the empirical literature on overeducation often say more about the way overeducation is measured than about overeducation itself. Hence, measuring overeducation in several ways and a good knowledge of the pros and cons of these measures is needed to interpret the empirical results and draw correct conclusions.

References

Alba-Ramírez A. (1993), 'Mismatch in the Spanish Labor Market', *Journal of Human Resources*, 28 (2), 259-278.

Allen J. and van der Velden R. (2001), 'Educational mismatches versus skill mismatches: effects on wages, job satisfaction, and on-the-job search', *Oxford Economic Papers*, 3, 434-452.

Arrow K. (1973), 'Higher education as a filter', *Journal of Public Economics*, 2 (3), 193-216.

Arrow K. (1973), 'The theory of discrimination', in *Discrimination in Labor Markets*, eds. O. Ashenfelter and A. Rees, Princeton University Press, 3-33.

Battu H., Belfield C. and Sloane P. (1999), 'Overeducation among graduates: a cohort view', *Education Economics*, 7 (1), 21-39.

Battu H. and Sloane P. (2000), 'Overeducation and Crowding Out in Britain', in *The Overeducated Worker?*, ed. by L. Borghans and A. de Grip, Edward Elgar, 157-174.

Battu H. and Sloane P. (2002), 'To what extent are ethnic minorities in Britain overeducated?', *International Journal of Manpower*, 23 (3) 192-208.

Becker G. (1957), *The Economics of Discrimination*, University of Chicago Press, 137p.

Beneito P., Ferri J., Moltó M.L. and Uriel E. (2002), 'Over/undereducation and specific training in Spain', in *Education and Training in a Knowledge-Based Economy*, ed. by H. Heijke and J. Muyskens, p191-214.

Büchel F. and Pollmann-Schult M. (2001), 'Overeducation and skill endowments: the role of school achievement and vocational training quality', *IZA Discussion Paper*, 337.

CBS (1992), 'Standaard beroepenclassificatie 1992', Den Haag: SDU.

Chevalier (2003), 'Measuring Over-education', *Economica*, 70 (3), 509-531.

Dolton P. and Silles M. (2001), 'Over-education in the graduate labour market: some evidence from alumni data', *CEE Discussion Paper*, June 2001, 40p.

Duncan G. and Hoffman S. (1981), 'The incidence and wage effects of overeducation', *Economics of Education Review*, 1 (1), 75-86.

Frank R. (1978), 'Why women earn less: the theory and estimation of differential overqualification', *American Economic Review*, 68 (3), 360-373.

Giret J.F. and Hatot C. (2001), ‘Mesurer le déclassement à l’embauche: l’exemple de DUT et de BTS’, *Formation Emploi*, 76, 59-73.

Green F., McIntosh S. and Vignoles A. (1999), ‘Overeducation and skills – clarifying the concepts’, *CEP Discussion Paper*, 435.

Gronau R. (1974), ‘Wage comparisons: a selectivity bias’, *Journal of Political Economy*, 82 (6), 1119-1155.

Groot W. (1996), ‘The incidence of, and returns to overeducation in the UK’, *Applied Economics,* 1345-1350.

Groot W. and Maassen van den Brink H. (2000), ‘Overeducation in the labor market: a meta-analysis’, *Economics of Education Review*, 19, p149-158.

Halaby C. (1994), ‘Overeducation and skill mismatch’, *Sociology of Education*, 67 (1), 47-59.

Hartog J. (2000), ‘Overeducation and earnings: where are we, where should we go?’, *Economics of Education Review*, 19, p131-147.

Hartog J. and Oosterbeek H. (1988), ‘Education, Allocation and Earnings in the Netherlands: Overschooling?’, *Economics of Education Review*, 7 (2), 185-194.

Kiker B., Santos M. and Mendes de Oliveira M. (1997), ‘Overeducation and Undereducation : Evidence for Portugal’, *Economics of Education Review*, 16 (2), 111-125.

Knight J. (1979), ‘Job competition, occupational production functions, and filtering down’, *Oxford Economic Papers*, 31, 187-204.

Lassibille G., Navarro Gómez L., Aquilar Ramos I. and de la O Sánchez (2001), ‘Youth transition from school to work in Spain’, *Economics of Education Review*, 139-149.

McGoldrick K. and Robst J. (1996), ‘Gender differences in overeducation, a test of the theory of differential overqualification’, *American Economic Review*, 86 (2), 280-284.

Mincer J. (1974), *Schooling, Experience and Earnings*, NBER.

Mortensen D. (1986), ‘Job search and labor market analysis’, in *Handbook of Labor Economics*, Vol. II, ed. by O. Ashenfelter and R. Layard, 849-919.

Phelps E. (1972), ‘The statistical theory of racism and sexism’, *American Economic Review*, 62 (4), 659-661.

Renes G. and Ridder G. (1995), ‘Are women overqualified’, *Labour Economics*, 2 (1), 3-18.

Robst J. (1995), ‘College Quality and Overeducation’, *Economics of Education Review*, 14 (3), 221-228.

Rumberger R. (1987), ‘The impact of surplus schooling on productivity and earnings’, *Journal of Human Resources*, 22 (1), 24-50.

Sattinger M. (1993), ‘Assignment Models of the Distribution of Earnings’, *Journal of Economic Literature*, 31 (2), 831-880.

Sloane P. (2002), 'Much ado about nothing?', Paper presented at the conference *Overeducation in Europe: What do we know?*, Max Planck Institute Berlin, 22-23 november 2002, 50p.

Sloane P., Battu H. and Seaman P., (1996), 'Overeducation and the formal education/experience and training trade-off', *Applied Economics Letters*, 3, 511-15.

Sloane P., Battu H. and Seaman P. (1999), 'Overeducation, undereducation and the British labour market', *Applied Economics*, 31, 1437-1453.

SONAR (2003), 'Van school naar werk', eindrapport.

Spence M. (1973), 'Job Market Signalling', *Quarterly Journal of Economics*, 87 (3), p355-374.

Storesletten K. and Zilibotti F. (2000), 'Education, educational policy and growth', *Swedish Economic Policy Review*, 7(1), p41-70.

Thurow L. (1975), *Generating Inequality*, New York: Basic Books.

VDAB (2000), *Analyse vacatures 2000: Knelpuntberoepen*, VDAB: Brussel.

Verbeek M. (2000), *A guide to modern econometrics*, John Wiley and Sons.

Verdugo R. and Verdugo N. (1989), 'The impact of surplus schooling on earnings', *Journal of Human Resources*, 22 (4), 690-695.

Verhaest D. and Omey E. (2004), 'The impact of overeducation and its measurement', *FEB Working Paper*, no. 215, Ghent University, 26p.

Van der Meer P. and Wielers R. (1996), 'Educational credentials and trust in the labor market', *Kyklos*, 49 (1), 29-46.

Appendix A: Variable definitions

Educational Levels (E)

(1) <LS = Less than lower secondary education.

(2) LS = Lower secondary education. This is defined as a second degree secondary and corresponds to 4 years of secondary education.

(3) HS = Higher secondary education. This is defined as a third degree secondary and corresponds to 6 years of secondary education.

(4) LT = Lower tertiary education. This is defined as short higher education and corresponds to higher education of three years.

(5) HS = Higher tertiary education. This is defined as higher education at university or universitary level and corresponds to higher education of minimally four years.

The educational levels are recoded into dummy variables with HS as reference.

Complexity Levels (C)

The job levels correspond to the same categories as the educational levels and are coded in the same way. The computation is based on 3 measurement methods:

JA = Job Analysis: Based on the Standard Occupation Classification of 1992 of the Dutch Central Bureau of Statistics (CBS).

RL = Required level to get the job: Based on the question: 'To get your job, what educational level were you required to have?'.

RM = Realised Matches. Based on the model value of attained education within each two-digit level occupation of the CBS-classification.

Worker characteristics (X)

Woman = Dummy coded 1 if woman.

Non-white = Dummy coded 1 if individual has a grandmother at the mothers side who has a birth or nationality from outside Europe and North-America.

HT father = Dummy coded 1 if individual has a father with a higher tertiary qualification.

Search behaviour = Two dummies for individuals which started their search activity respectively more than one month and less than one month before leaving school.

Study results = Two dummies for the following study results in the last year of tertiary education: distinction and great distinction.

Part-time = dummy for HS school leavers who obtained their HS degree in part-time education.

Extra part-time = dummy for HS school leavers who obtained after their full-time HS degree an extra part-time degree.

Seventh year = dummy for HS school leavers who obtained after their full-time HS degree a qualification for an additional seventh year.

Not finished TE = dummy for HS school leavers who finished at least one year in tertiary education, without obtaining the final degree.

University = dummy for HT school leavers who obtained their degree at university.

Regional Residence = 5 categories of regional residence recoded into 4 dummies. The categories correspond to 5 Flemish provinces.

Job characteristics (Y)

Firm Size = Four categories recoded into 3 dummies. Categories based on number of workers in the firm.

Occupations = 3 dummies for the following occupations: technical professions (CBS6), clerical professions (CBS11) and socio-cultural professions (CBS15-16).

Sector = 13 categories recoded into 12 dummies. Categories based on NACE-classification.

Region of Employment = 5 categories recoded into 4 dummies. The categories correspond to the 5 Flemish provinces (Brussels is included in the category Vlaams-Brabant).

Type of contract = 1 dummy coded 1 if part-time contract, 1 dummy for temporary contract.

Unmeasured Complexity = Variable created by factor and regression analysis from five skills needed to do the job (cf. Appendix B). The skills are derived from the following question: 'Do you totally agree, rather agree, rather disagree or totally disagree, in my job you need the skills to …':

(1) supervise other people (leadership skills),
(2) charge a lot of responsibilities (responsibility skills),
(3) read and write fluently (reading and writing skills),
(4) calculate and deal with numbers (mathematical skills),
(5) collaborate with other people (social skills).

Appendix B: Factor and regression analysis of unmeasured job complexity

Table B1: Principal component analysis: factor loadings (Cronbach's α = ,724)

Responsibility skills	,697
Leadership skills	,571
Reading and writing skills	,761
Mathematical skills	,666
Social skills	,752

Table B2: OLS regression of complexity factor on measured job levels: coefficients and standard errors (in parentheses)

Job level measurement	JA		RL		RM	
Complexity level C						
(1) <LS	-0,843	(,086)	-0,540	(,070)	-	
(2) LS	-0,273	(,097)	-0,178	(,114)	-	
(3) HS	0,142	(,092)	0,048	(,075)	-0,368	(,087)
(4) LT	0,735	(,092)	0,632	(,074)	0,626	(,090)
(5) HT	0,660	(,095)	0,639	(,063)	0,634	(,084)
Adjusted R^2	0,279		0,251		0,231	
N	2145		2091		2145	

Appendix C: Estimated probabilities

Table C1: Estimated probabilities of finding a job with minimally level k by educational level

complexity level *k*		Educational level E (1) <LS	(2) LS	(3) HS	(4) LT	(5) HT
JA	(1) <LS	100,0%	100,0%	100,0%	100,0%	100,0%
	(2) LS	55,9%	58,5%	78,7%	99,2%	99,9%
	(3) HS	14,5%	15,9%	33,1%	94,1%	99,1%
	(4) LT	1,3%	1,5%	3,7%	55,5%	90,1%
	(5) HT	0,0%	0,1%	0,1%	4,1%	23,9%
RL	(1) <LS	100,0%	100,0%	100,0%	100,0%	100,0%
	(2) LS	12,7%	14,0%	42,1%	97,3%	100,0%
	(3) HS	10,1%	11,2%	36,1%	96,6%	100,0%
	(4) LT	1,3%	1,5%	6,4%	77,4%	99,6%
	(5) HT	0,0%	0,0%	0,1%	4,5%	78,1%
RM	(3) HS		100,0%	100,0%	100,0%	100,0%
	(4) LT		2,2%	8,5%	80,5%	98,1%
	(5) HT		0,0%	0,1%	3,8%	33,2%

Table C2: Estim. probabilities of hiring a worker with minimally level l by complexity level

Educational level *l*	Complexity level C (1) <LS	(2) LS	(3) HS	(4) LT	(5) HT
			JA		
(1) <LS	100,0%	100,0%	100,0%	100,0%	100,0%
(2) LS	92,0%	96,6%	99,3%	99,9%	100,0%
(3) HS	77,5%	89,6%	97,8%	99,8%	100,0%
(4) LT	4,1%	9,7%	35,2%	85,6%	99,8%
(5) HT	0,1%	0,4%	1,8%	16,6%	94,0%
			RL		
(1) <LS	100,0%	100,0%	100,0%	100,0%	100,0%
(2) LS	95,4%	95,9%	98,4%	100,0%	100,0%
(3) HS	86,3%	87,8%	95,0%	99,9%	100,0%
(4) LT	5,7%	6,5%	15,6%	89,0%	100,0%
(5) HT	0,0%	0,0%	0,1%	5,1%	93,3%
			RM		
(1) <LS			100,0%	100,0%	100,0%
(2) LS			96,2%	99,9%	100,0%
(3) HS			88,8%	99,6%	100,0%
(4) LT			10,3%	76,5%	99,4%
(5) HT			0,5%	11,7%	86,9%

Table C3: Estim. probabilities of minimally reservation educational level r by job level C

Reservation ed. level *r* (RL)	Complexity level C (JA) (1) <LS	(2) LS	(3) HS	(4) LT	(5) HT
(1) <LS	100,0%	100,0%	100,0%	100,0%	100,0%
(2) LS	12,0%	40,5%	81,1%	97,8%	99,9%
(3) HS	9,2%	33,4%	76,0%	97,0%	99,9%
(4) LT	1,4%	6,4%	30,1%	81,5%	99,5%
(5) HT	0,0%	0,2%	1,5%	13,7%	86,9%

UNIVERSITEIT GENT

FACULTEIT ECONOMIE EN BEDRIJFSKUNDE
HOVENIERSBERG 24
9000 GENT

Tel. : 32 - (0)9 – 264.34.61
Fax. : 32 - (0)9 – 264.35.92

WORKING PAPER SERIES

01/119 **N. GOBBIN, B. VAN AARLE**, Fiscal Adjustments and Their Effects during the Transition to the EMU, October 2001, 28 p. (published in *Public Choice*, 2001).

01/120 **A. DE VOS, D. BUYENS, R. SCHALK**, Antecedents of the Psychological Contract: The Impact of Work Values and Exchange Orientation on Organizational Newcomers' Psychological Contracts, November 2001, 41 p.

01/121 **A. VAN LANDSCHOOT**, Sovereign Credit Spreads and the Composition of the Government Budget, November 2001, 29 p. (forthcoming in *Weltwirtschaftliches Archiv*, 2004).

01/122 **K. SCHOORS**, The fate of Russia's former state banks: Chronicle of a restructuring postponed and a crisis foretold**,** November 2001, 54 p**.** (published in *Europe-Asia Studies*, 2003)

01/123 **J. ALBRECHT, D. FRANÇOIS, K. SCHOORS**, A Shapley Decomposition of Carbon Emissions without Residuals, December 2001, 21 p. (published in *Energy Policy*, 2002).

01/124 **T. DE LANGHE, H. OOGHE**, Are Acquisitions Worthwhile? An Empirical Study of the Post-Acquisition Performance of Privately Held Belgian Companies Involved in Take-overs, December 2001, 29 p**.**

01/125 **L. POZZI**, Government debt, imperfect information and fiscal policy effects on private consumption. Evidence for 2 high debt countries, December 2001, 34 p**.**

02/126 **G. RAYP, W. MEEUSEN**, Social Protection Competition in the EMU, January 2002, 20 p.

02/127 **S. DE MAN, P. GEMMEL, P. VLERICK, P. VAN RIJK, R. DIERCKX**, Patients' and personnel's perceptions of service quality and patient satisfaction in nuclear medicine, January 2002, 21 p.

02/128 **T. VERBEKE, M. DE CLERCQ**, Environmental Quality and Economic Growth, January 2002, 48 p.

02/129 **T. VERBEKE, M. DE CLERCQ,** Environmental policy, policy uncertainty and relocation decisions, January 2002, 33 p.

02/130 **W. BRUGGEMAN, V. DECOENE,** An Empirical Study of the Influence of Balanced Scorecard-Based Variable Remuneration on the Performance Motivation of Operating Managers, January 2002, 19 p.

02/131 **B. CLARYSSE, N. MORAY, A. HEIRMAN,** Transferring Technology by Spinning off Ventures: Towards an empirically based understanding of the spin off process, January 2002, 32 p.

02/132 **H. OOGHE, S. BALCAEN,** Are Failure Prediction Models Transferable From One Country to Another? An Empirical Study Using Belgian Financial Statements, February 2002, 42 p.

02/133 **M. VANHOUCKE, E. DEMEULEMEESTER, W. HERROELEN,** Discrete Time/Cost Trade-offs in Project scheduling with Time-Switch Constraints? February 2002, 23 p. (published in *Journal of the Operational Research Society*, 2002)

02/134 **C. MAYER, K. SCHOORS, Y. YAFEH,** Sources of Funds and Investment Activities of Venture Capital Funds: Evidence from Germany, Israel, Japan and the UK?, February 2002, 31 p. (forthcoming in *Journal of Corporate Finance*, 2004)

02/135 **K. DEWETTINCK, D. BUYENS,** Employment implications of downsizing strategies and reorientation practices: an empirical exploration, February 2002, 22 p.

02/136 **M. DELOOF, M. DE MAESENEIRE, K. INGHELBRECHT,** The Valuation of IPOs by Investment Banks and the Stock Market: Empirical Evidence, February 2002, 24 p.

02/137 **P. EVERAERT, W. BRUGGEMAN,** Cost Targets and Time Pressure during New Product Development, March 2002, 21 p. (published in *International Journal of Operations and Production Management,* 2002*).*

02/138 **D. O'NEILL, O. SWEETMAN, D. VAN DE GAER,** The impact of cognitive skills on the distribution of the black-white wage gap, March 2002, 14 p.

UNIVERSITEIT GENT

FACULTEIT ECONOMIE EN BEDRIJFSKUNDE
HOVENIERSBERG 24
9000 GENT

Tel. : 32 - (0)9 – 264.34.61
Fax. : 32 - (0)9 – 264.35.92

02/139 **W. DE MAESENEIRE, S. MANIGART**, Initial returns: underpricing or overvaluation? Evidence from Easdaq and EuroNM, March 2002, 36 p.

02/140 **K. SCHOORS**, Should the Central and Eastern European accession countries adopt the EURO before or after accession? March 2002, 29p. (published in *Economics of Planning*, 2002).

02/141 **D. VERHAEST, E. OMEY**, Overeducation in the Flemish Youth Labour Market, March 2002, 39p.

02/142 **L. CUYVERS, M. DUMONT, G. RAYP, K. STEVENS**, Wage and Employment Effects in the EU of International Trade with the Emerging Economies, April 2002, 24 p. (published in *Weltwirtschaftliches Archiv*, 2003).

02/143 **M. GEUENS, P. DE PELSMACKER,** The Role of Humor in the Persuasion of Individuals Varying in Need for Cognition, April 2002, 19 p. (published in *Advances in Consumer Research*, 2002).

02/144 **M. VANHOUCKE, E. DEMEULEMEESTER, W. HERROELEN,** Net Present Value Maximization of Projects with Progress Payments, April 2002, 23 p. (published in *European Journal of Operational Research*, 2003)

02/145 **E. SCHOKKAERT, D. VAN DE GAER, F. VANDENBROUCKE,** Responsibility-sensitive egalitarianism and optimal linear income taxation, April 2002, 37p. (revised version, co-authored by R. Luttens, forthcoming in *Mathematical Social Sciences*, 2004).

02/146 **J. ANNAERT, J. CROMBEZ, B. SPINEL, F. VAN HOLLE**, Value and size effect: Now you see it, now you don't, May 2002, 31 p.

02/147 **N. HOUTHOOFD, A. HEENE,** The quest for strategic groups: Overview, and suggestions for future research, July 2002, 22 p.

02/148 **G. PEERSMAN,** The transmission of monetary policy in the Euro area: Are the effects different across countries?, July 2002, 35 p.

02/149 **G. PEERSMAN, F. SMETS,** The industry effects of monetary policy in the Euro area, July 2002, 30 p.

02/150 **J. BOUCKAERT, G. DHAENE**, Inter-Ethnic Trust and Reciprocity: Results of an Experiment with Small Business Entrepreneurs, July 2002, 27 p. (forthcoming in *European Journal of Political Economy*, 2004)

02/151 **S. GARRÉ, I. DE BEELDE, Y. LEVANT**, The impact of accounting differences between France and Belgium, August 2002, 28 p. (published in French in *Comptabilité - Controle - Audit*, 2002)

02/152 **R. VANDER VENNET**, Cross-border mergers in European banking and bank efficiency, September 2002, 42 p.

02/153 **K. SCHOORS,** Financial regulation in Central Europe: the role of reserve requirements and capital rules, September 2002, 22 p.

02/154 **B. BAESENS, G. VERSTRAETEN, D. VAN DEN POEL, M. EGMONT-PETERSEN, P. VAN KENHOVE, J. VANTHIENEN**, Bayesian Network Classifiers for Identifying the Slope of the Customer Lifecycle of Long-Life Customers, October 2002, 27 p. (forthcoming in *European Journal of Operational Research*, 2003).

02/155 **L. POZZI, F. HEYLEN, M. DOSSCHE,** Government debt and the excess sensitivity of private consumption to current income: an empirical analysis for OECD countries, October 2002, 19 p. (forthcoming in *Economic Inquiry*, 2004)

02/156 **D. O'NEILL, O. SWEETMAN, D. VAN DE GAER**, Consequences of Specification Error for Distributional Analysis With an Application to Intergenerational Mobility, November 2002, 35 p.

02/157 **K. SCHOORS, B. VAN DER TOL**, Foreign direct investment spillovers within and between sectors: Evidence from Hungarian data, November 2002, 29 p.

02/158 **L. CUYVERS, M. DUMONT, G. RAYP, K. STEVENS,** Home Employment Effects of EU Firms' Activities in Central and Eastern European Countries, November 2002, 25 p.

02/159 **M. VANHOUCKE**, Optimal due date assignment in project scheduling, December 2002, 18 p.

02/160 **J. ANNAERT, M.J.K. DE CEUSTER, W. VANHYFTE**, The Value of Asset Allocation Advice. Evidence from the Economist's Quarterly Portfolio Poll, December 2002, 35p. (revised version forthcoming in *Journal of Banking and Finance*, 2004)

02/161 **M. GEUENS, P. DE PELSMACKER**, Developing a Short Affect Intensity Scale, December 2002, 20 p. (published in *Psychological Reports*, 2002).

02/162 **P. DE PELSMACKER, M. GEUENS, P. ANCKAERT**, Media context and advertising effectiveness: The role of context appreciation and context-ad similarity, December 2002, 23 p. (published in *Journal of Advertising*, 2002).

03/163 **M. GEUENS, D. VANTOMME, G. GOESSAERT, B. WEIJTERS**, Assessing the impact of offline URL advertising, January 2003, 20 p.

03/164 **D. VAN DEN POEL, B. LARIVIÈRE,** Customer Attrition Analysis For Financial Services Using Proportional Hazard Models, January 2003, 39 p. (forthcoming in *European Journal of Operational Research*, 2003)

03/165 **P. DE PELSMACKER, L. DRIESEN, G. RAYP,** Are fair trade labels good business ? Ethics and coffee buying intentions, January 2003, 20 p.

03/166 **D. VANDAELE, P. GEMMEL,** Service Level Agreements – Een literatuuroverzicht, Januari 2003, 31 p. (published in *Tijdschrift voor Economie en Management*, 2003).

03/167 **P. VAN KENHOVE, K. DE WULF AND S. STEENHAUT**, The relationship between consumers' unethical behavior and customer loyalty in a retail environment, February 2003, 27 p. (published in *Journal of Business Ethics*, 2003).

03/168 **P. VAN KENHOVE, K. DE WULF, D. VAN DEN POEL**, Does attitudinal commitment to stores always lead to behavioural loyalty? The moderating effect of age, February 2003, 20 p.

03/169 **E. VERHOFSTADT, E. OMEY,** The impact of education on job satisfaction in the first job, March 2003, 16 p.

03/170 **S. DOBBELAERE**, Ownership, Firm Size and Rent Sharing in a Transition Country, March 2003, 26 p. (forthcoming in *Labour Economics*, 2004)

03/171 **S. DOBBELAERE**, Joint Estimation of Price-Cost Margins and Union Bargaining Power for Belgian Manufacturing, March 2003, 29 p.

03/172 **M. DUMONT, G. RAYP, P. WILLEMÉ, O. THAS,** Correcting Standard Errors in Two-Stage Estimation Procedures with Generated Regressands, April 2003, 12 p.

03/173 **L. POZZI**, Imperfect information and the excess sensitivity of private consumption to government expenditures, April 2003, 25 p.

03/174 **F. HEYLEN, A. SCHOLLAERT, G. EVERAERT, L. POZZI**, Inflation and human capital formation: theory and panel data evidence, April 2003, 24 p.

03/175 **N.A. DENTCHEV, A. HEENE**, Reputation management: Sending the right signal to the right stakeholder, April 2003, 26 p.

03/176 **A. WILLEM, M. BUELENS**, Making competencies cross business unit boundaries: the interplay between inter-unit coordination, trust and knowledge transferability, April 2003, 37 p.

03/177 **K. SCHOORS, K. SONIN**, Passive creditors, May 2003, 33 p.

03/178 **W. BUCKINX, D. VAN DEN POEL,** Customer Base Analysis: Partial Defection of Behaviorally-Loyal Clients in a Non-Contractual FMCG Retail Setting, May 2003, 26 p. (forthcoming in *European Journal of Operational Research*)

03/179 **H. OOGHE, T. DE LANGHE, J. CAMERLYNCK**, Profile of multiple versus single acquirers and their targets : a research note, June 2003, 15 p.

UNIVERSITEIT GENT

FACULTEIT ECONOMIE EN BEDRIJFSKUNDE
HOVENIERSBERG 24
9000 GENT

Tel. : 32 - (0)9 – 264.34.61
Fax. : 32 - (0)9 – 264.35.92

WORKING PAPER SERIES

03/180 **M. NEYT, J. ALBRECHT, B. CLARYSSE, V. COCQUYT,** The Cost-Effectiveness of Herceptin® in a Standard Cost Model for Breast-Cancer Treatment in a Belgian University Hospital, June 2003, 20 p.

03/181 **M. VANHOUCKE,** New computational results for the discrete time/cost trade-off problem with time-switch constraints, June 2003, 24 p.

03/182 **C. SCHLUTER, D. VAN DE GAER**, Mobility as distributional difference, June 2003, 22 p.

03/183 **B. MERLEVEDE**, Reform Reversals and Output Growth in Transition Economies, June 2003, 35 p. (published in *Economics of Transition*, 2003)

03/184 **G. POELS**, Functional Size Measurement of Multi-Layer Object-Oriented Conceptual Models, June 2003, 13 p. (published as 'Object-oriented information systems' in *Lecture Notes in Computer Science*, 2003)

03/185 **A. VEREECKE, M. STEVENS, E. PANDELAERE, D. DESCHOOLMEESTER**, A classification of programmes and its managerial impact, June 2003, 11 p. (forthcoming in *International Journal of Operations and Production Management,* 2003)

03/186 **S. STEENHAUT, P. VANKENHOVE**, Consumers' Reactions to "Receiving Too Much Change at the Checkout", July 2003, 28 p.

03/187 **H. OOGHE, N. WAEYAERT**, Oorzaken van faling en falingspaden: Literatuuroverzicht en conceptueel verklarings-model, July 2003, 35 p.

03/188 **S. SCHILLER, I. DE BEELDE**, Disclosure of improvement activities related to tangible assets, August 2003, 21 p.

03/189 **L. BAELE,** Volatility Spillover Effects in European Equity Markets, August 2003, 73 p.

03/190 **A. SCHOLLAERT, D. VAN DE GAER,** Trust, Primary Commodity Dependence and Segregation, August 2003, 18 p

03/191 **D. VAN DEN POEL,** Predicting Mail-Order Repeat Buying: Which Variables Matter?, August 2003, 25 p. (published in *Tijdschrift voor Economie en Management*, 2003)

03/192 **T. VERBEKE, M. DE CLERCQ**, The income-environment relationship: Does a logit model offer an alternative empirical strategy?, September 2003, 32 p.

03/193 **S. HERMANNS, H. OOGHE, E. VAN LAERE, C. VAN WYMEERSCH**, Het type controleverslag: resultaten van een empirisch onderzoek in België, September 2003, 18 p.

03/194 **A. DE VOS, D. BUYENS, R. SCHALK**, Psychological Contract Development during Organizational Socialization: Adaptation to Reality and the Role of Reciprocity, September 2003, 42 p.

03/195 **W. BUCKINX, D. VAN DEN POEL,** Predicting Online Purchasing Behavior, September 2003, 43 p.

03/196 **N.A. DENTCHEV, A. HEENE**, Toward stakeholder responsibility and stakeholder motivation: Systemic and holistic perspectives on corporate sustainability, September 2003, 37 p.

03/197 **D. HEYMAN, M. DELOOF, H. OOGHE**, The Debt-Maturity Structure of Small Firms in a Creditor-Oriented Environment, September 2003, 22 p.

03/198 **A. HEIRMAN, B. CLARYSSE, V. VAN DEN HAUTE**, How and Why Do Firms Differ at Start-Up? A Resource-Based Configurational Perspective, September 2003, 43 p.

03/199 **M. GENERO, G. POELS, M. PIATTINI**, Defining and Validating Metrics for Assessing the Maintainability of Entity-Relationship Diagrams, October 2003, 61 p.

UNIVERSITEIT GENT

FACULTEIT ECONOMIE EN BEDRIJFSKUNDE
HOVENIERSBERG 24
9000 GENT

Tel. : 32 - (0)9 – 264.34.61
Fax. : 32 - (0)9 – 264.35.92

WORKING PAPER SERIES

03/200 **V. DECOENE, W. BRUGGEMAN**, Strategic alignment of manufacturing processes in a Balanced Scorecard-based compensation plan: a theory illustration case, October 2003, 22 p.

03/201 **W. BUCKINX, E. MOONS, D. VAN DEN POEL, G. WETS,** Customer-Adapted Coupon Targeting Using Feature Selection, November 2003, 31 p. (forthcoming in *Expert Systems with Applications*).

03/202 **D. VAN DEN POEL, J. DE SCHAMPHELAERE, G. WETS**, Direct and Indirect Effects of Retail Promotions, November 2003, 21 p. (forthcoming in *Expert Systems with Applications*).

03/203 **S. CLAEYS, R. VANDER VENNET**, Determinants of bank interest margins in Central and Eastern Europe. Convergence to the West?, November 2003, 28 p.

03/204 **M. BRENGMAN, M. GEUENS**, The four dimensional impact of color on shoppers' emotions, December 2003, 15 p. (forthcoming in *Advances in Consumer Research*, 2004)

03/205 **M. BRENGMAN, M. GEUENS, B. WEIJTERS, S.C. SMITH, W.R. SWINYARD,** Segmenting Internet shoppers based on their web-usage-related lifestyle: a cross-cultural validation, December 2003, 15 p. (forthcoming in *Journal of Business Research*, 2004)

03/206 **M. GEUENS, D. VANTOMME, M. BRENGMAN**, Developing a typology of airport shoppers, December 2003, 13 p. (forthcoming in *Tourism Management*, 2004)

03/207 **J. CHRISTIAENS, C. VANHEE**, Capital Assets in Governmental Accounting Reforms, December 2003, 25 p.

03/208 **T. VERBEKE, M. DE CLERCQ**, Environmental policy uncertainty, policy coordination and relocation decisions, December 2003, 32 p.

03/209 **A. DE VOS, D. BUYENS, R. SCHALK**, Making Sense of a New Employment Relationship: Psychological Contract-Related Information Seeking and the Role of Work Values and Locus of Control, December 2003, 32 p.

03/210 **K. DEWETTINCK, J. SINGH, D. BUYENS**, Psychological Empowerment in the Workplace: Reviewing the Empowerment Effects on Critical Work Outcomes, December 2003, 24 p.

03/211 **M. DAKHLI, D. DE CLERCQ**, Human Capital, Social Capital and Innovation: A Multi-Country Study, November 2003, 32 p. (forthcoming in *Entrepreneurship and Regional Development*, 2004).

03/212 **D. DE CLERCQ, H.J. SAPIENZA, H. CRIJNS**, The Internationalization of Small and Medium-Sized Firms: The Role of Organizational Learning Effort and Entrepreneurial Orientation, November 2003, 22 p (forthcoming in *Small Business Economics*, 2004).

03/213 **A. PRINZIE, D. VAN DEN POEL**, Investigating Purchasing Patterns for Financial Services using Markov, MTD and MTDg Models, December 2003, 40 p.

03/214 **J.-J. JONKER, N. PIERSMA, D. VAN DEN POEL,** Joint Optimization of Customer Segmentation and Marketing Policy to Maximize Long-Term Profitability, December 2003, 20 p.